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The present conditions continuing, where now the deep sea-blue waters of the lake are flushed with the tints of sunset, a rich valley will one day become the home of industry, and its green fields will be animated with the flocks of the husbandman.

A COSMOPOLITAN BUTTERFLY. I. ITS BIRTHPLACE.

BY SAMUEL H. SCUDDER.

THERE is but one butterfly whose range is so extended as to merit the name of cosmopolitan ; it is the Painted Lady or *Vanessa cardui.* With the exception of the arctic regions and South America, it is distributed over the entire extent of every continent. Australia and New Zealand produce a race peculiar to themselves, while the other large islands south of Asia possess the normal type, which is also found upon small islands lying off the western borders of the Old World, the Azores, Canaries, Madeira, and St. Helena. On the other hand, it has not been discovered upon the small islands off the American coast, such as Guadalupe, the Revillagegidos, and Galapagos on the western side, or the Bahamas and Bermudas on the eastern ; neither does it occur in any of the Antilles, excepting Cuba, and there but rarely.[1] It is reported, however, from islands lying in the middle of the Pacific Ocean, such as the Hawaiian group and Tahiti, but its actual occurrence there is at least doubtful.[2]

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[1] Cramer gives it, but probably by mistake, from Jamaica.

[2] The improbability of the occurrence of this insect upon islands lying in the middle of the Pacific Ocean has led me to look carefully into the origin of this general belief. The sole authority for Tahiti is Boisduval, who remarked forty years ago (Nouv. Ann. Mus. Nat. Hist., ii. 191) that he possessed specimens from Tahiti, Brazil, Cayenne, etc.; but it should be noticed that *V. cardui* is not now recognized from Brazil and Cayenne, and that Dr. Boisduval is not considered too careful in his geographical statements ; moreover, Mr. A. G. Butler does not mention it in his List of the Diurnal Lepidoptera of the South Sea Islands (Proc. Zoöl. Soc. Lond., 1874, 274 seq.), and Dr. C. Pickering, the naturalist of Wilkes' Exploring Expedition, tells me that it was unknown on Tahiti in 1839.

The single citation of the Hawaiian Islands will be found in the first list of the British Museum Butterflies, where (p. 79) Mr. Doubleday credits four specimens to those islands, two brought by Captain Byron and two by Captain Beechey. I am informed by Mr. Butler that there is now only one specimen in the museum from the "Sandwich Islands," and the reference upon the ticket is to the oldest manuscript register, not now to be found. Byron and Beechey were at the islands in 1825–27. Mr. W. T. Brigham informs me that *V. cardui* was not found by Mr. Mann and himself during a twelvemonth's residence at the islands ten years ago, and I can find no authority for its present existence. Dr. Pickering writes that it was unknown when Wilkes's expedition visited the islands in 1840–41. The Vincennes, to which Dr. Pickering was attached, was at the islands from the end of September to the beginning of April. Byron and Beechey's visits were between the latter part of January

On the American continent, its southern boundaries will probably be found in Venezuela, New Grenada, and Ecuador,[1] but it is abundant even as far south as the highlands of Guatemala, and thence stretches northward over the entire breadth of the continent to the arctic regions; on the eastern coast it has been found as far as Labrador, and on the west to the eastern shores of Behring's Straits.[2] In the heart of the continent I have taken it upon the Saskatchewan, and Doubleday reports it from Martin's Falls; but Mr. W. H. Edwards does not recollect seeing it in the few collections he has examined from points farther north.

As we see it flourishing in the colder regions of Europe and North America, so also is it found on all mountain heights; and Mr. H. W. Bates, writing of the whole genus, distinctly says it is "found only in elevated places in the neighborhood of the equator." The stations in Southern Asia from which *V. cardui* has been reported, — Cashmere, Nepaul, Bootan, and Sikkim, — all lie on the flanks of the Himalayas, and the Nilgherry Hills are the highest elevations of the Indian peninsula. In the Alps of Europe this insect flies to the snow level; but in North America, although it may be regarded as one of the commonest butterflies in the elevated central district, it is most abundant at a level of seven or eight thousand feet. Lieut. W. L. Carpenter and others have never found it above the timber line; but Dr. A. S. Packard, Jr., has taken it on Arapahoe Peak, between eleven and twelve thousand feet, and on Pike's Peak from eight thousand feet to within five hundred or a thousand feet from the summit.

We naturally inquire, Where did this cosmopolitan creature originate? Judging from its present distribution alone, we should probably answer: In the temperate parts of the Old World; because in the New World it has penetrated but a short distance into South America, and has established no colonies upon the neighboring islands, excepting on Cuba; while in the Old World

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and the middle of July. Mr. Butler does not consider the specimen in the British Museum, nor the record of Doubleday, sufficient authority to include this insect in his list of South Sea butterflies. Upon the whole, we cannot fairly accept the present authority for the presence of this insect in the Pacific Islands.

[1] Wagner took a single specimen near Quito in an eight months' residence there.

[2] This statement is made on the authority of Wagner (Sitzungsb. k. b. Akad. Wiss., 1870, ii. 170), but at the same time he asserts that this butterfly is found on "all the Aleutian Islands," which is certainly incorrect. Lieut. W. H. Dall, whose natural history explorations in Alaska are well known, writes very positively that there are no macrolepidoptera whatever on any of the islands west of Unalashka; a fact he easily explains by the absence of trees or shrubs, the strong winds and the wide straits that separate the islands. East of Unalashka he knows of but two butterflies, a Pieris and a Polygonia.

it has not only crossed the equator, and colonized many of the islands of the Indian Ocean, but has founded a race beyond in Australia and New Zealand, and has reached many of the small islands lying off the coast of Spain and Africa, not to mention the questionable report of its presence on the Hawaiian islands and Tahiti, the affinities of whose populations are with the Old rather than with the New World. But this reply is not wholly satisfactory, although most writers in discussing its distribution have assumed an Old World origin.

To answer this query fairly, we must examine the distribution of the other species of the genus. At first we seem to gain little aid from this source, for we are perplexed by finding that another species, *V. Atalanta*, is also an inhabitant of two worlds, although confined almost exclusively to the north temperate regions of both, which seems a new complication; and, again, that the other species of the genus share between them nearly the entire globe. Thus in the Old World *V. Indica* is found in the region that bears its name; *V. Dejeanii* in the Malayan Archipelago; *V. Itea* in Australia and New Zealand (into which latter island it has probably spread from the former); *V. Gonerilla* in New Zealand; *V. Tammeamea* in the Hawaiian Islands; *V. Abyssinica* in Northeastern Africa; and *V. Hippomene* in Southeastern Africa and Madagascar. While in the New World, *V. Huntera* is found in North America, east (and to a slight extent west) of the Rocky Mountains; *V. Carye* west of the Cordilleras from California to Chili; *V. Myrinna* in the tropics of South America, east of the great mountain chain; and *V. Terpsichore* at the southern extremity of the continent.

But the species of the genus Vanessa (and all the recognized forms are here enumerated) fall into two natural groups: one of these contains such species as have upon the dark upper surface of the wings a conspicuous, bright-colored bow, crossing the middle of the fore wings and skirting, somewhat narrowly, the border of the hind wings; while the other comprises forms on whose upper surface the bright colors (usually some shades of red) nearly or quite predominate, but are broken by the darker parts into irregular blotches on the fore-wings, and form the ground color of the entire outer half of the hind wings, so that all effect of the somewhat regular bow of the other group is lost. There are further differences between them; the species of the former group have the paronychia distinctly bilaciniate, as pointed out by Doubleday; they have also the upper abdominal appendage bifid at tip, and their caterpillars live in a nest formed by drawing together the edges of a single leaf; while those of the latter have the inner lobe of the paronychia rudimentary, the upper abdominal appendage simple, and their caterpillars live in nests formed of many leaves.

Now *V. Atalanta* falls into the former section, and *V. cardui* into the latter; and if we put out of consideration for the moment the distribution of these two butterflies, since they occur alike in both worlds, we find that all the species of the first group are Old World species (including *V. Kammeamea*), and all the species of the second group are New World species. It is difficult to avoid the conclusion, therefore, that these two insects originated, each where its nearest congeners are exclusively found, namely, *V. Atalanta* in the Old World and *V. cardui* in the New; or, using the facts of distribution still further, *V. Atalanta* in Europe and *V. cardui* in North America.

That *V. cardui* should be found upon many of the outlying islands of the Old World, and upon almost none of those which surround its birthplace, is not a matter of much surprise. The butterfly-fauna of islands which have little or no indigenous population is almost altogether made up of a few species of great endurance and which hibernate as butterflies (that is, are longer lived than others in the imago state), and it seems pretty certain that their presence there at all is an accidental circumstance. Mr. J. M. Jones has recently given [1] a very interesting account of the sudden appearance in Bermuda of large numbers of *Terias Lisa*, a delicate-winged butterfly, common enough in the southern United States, but hitherto unknown to Bermuda, where he has detected only *Anosia Berenice*, *Danaida Archippus*, and *Junonia Cœnia;* and he very reasonably accounts for the sudden appearance of these little butterflies by supposing them to have been caught up by the winds in a period of great atmospheric disturbance, and whirled over the sea to this island. Another writer tells of the visit, during a cyclone, of numerous birds and insects to a ship six hundred miles from the African coast and two hundred from the Cape Verde Islands; among these were two butterflies, *Diadema Bolina* and *Vanessa cardui*, the latter at least not yet recorded from the Cape Verde Islands. Other instances might be given, but from these alone we may reasonably suppose that of the myriads of insects which perish from such accidents, a few now and then reach and people some hospitable shore.

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[1] Psyche for November, 1875.

Considering the wide and even tropical distribution of *V. cardui* in the Old World, its absence from South America seems not a little remarkable. But the species of cosmopolitan genera not very rich in species (like Vanessa) are generally conterraneous, or they occupy adjoining zoölogical provinces as equivalent species, species of replacement, or, as the Germans sometimes call them, vicarious species. But we have already seen that, if we leave out of account our cosmopolitan species, and restrict *V. Atalanta* to the Old World, where it actually belongs, each of the species of Vanessa occupies a separate zoölogical region, one adjoining another, over nearly the entire extent of either world. The cosmopolitan species, similarly restricted to the New World as its proper habitat, occupies nearly the same region as *V. Huntera*, extending no doubt farther north, and becoming less abundant toward the southern extremity of the common limits of the two, phenomena which are repeated in the distribution of our two common and wide-spread eastern species of *Argynnis*, *A. Cybele*, and *A. Aphrodite*. The absence of *Vanessa cardui* from South America is therefore rather an argument in favor of its American origin. The presence of the insect on the shores of Behring's Straits, as testified by Wagner, is an indication of its route from America to Asia; and this passage must have taken place in times so far distant that it has had opportunity to push its way even to Australia and New Zealand, and there to become so modified as to establish a peculiar race, once dignified by a specific name. If its presence in the Hawaiian Islands can be proved, such a fact would be more difficult to understand; but we can hardly doubt that *V. Tammeamea* and the other Old World species of Vanessa sprang from one original stock; and if the progenitors of the Hawaiian Islands species found a track from the Asiatic continent, so, plainly, could *Vanessa cardui*.

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THE LOBSTER; ITS STRUCTURE AND HISTORY.

BY J. S. KINGSLEY.

AS the season of summer schools is approaching, it has been thought advisable to give a short account of the anatomy of the lobster. This animal has been chosen not only on account of its size and the ease with which either it or its fresh-water cousin, the crayfish, can be obtained, but also from the intermediate position it occupies in the articulata, forming an important type of this branch of the animal kingdom. A few technical terms